SUPPLEMENT.

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

No. 1147.—Vol. XXVII.] LONDON, SATURDAY, AUGUST 15, 1857. [WITH JOURNAL.] STAMPED ....SIXPENCE. UNSTAMPED..FIVEPENCE.

CORNISH MINE PHOTOGRAPHS—No. X.

"THE PURSER."

After the captain, this gentleman takes the next official rank on the mine, and is, therefore, a person of some consequence in the count-house, which is, properly speaking, his department, in the office of which he reigns supreme. He is treated in all respects with the same deference by the men and *employés* as the captain, with whom he acts in direct concert, save and except underground operations. The situation is usually reckoned one of the greatest respectability, "esquire" being generally appended to the name of a mine purser or secretary; a regular emolument being derived, renders the post much sought after.

To those who are emulous of taking the office, we commend an attentive perusal of our photograph, "The First Dividend," as the pleasures of life under such circumstances are correctly pourtrayed; we mean in a mine in which protracted calls are necessary. *Quem Deus vult pendere prius dementat* should be well considered; the age and truthfulness of the axiom entitle it to respect. Ere they take the fearful step, let the bold adventurers think twice. If after such monition they will do so, we say, be ye therefore wise as serpents and harmless as doves; and even then we defy them to give satisfaction; to be all things unto all men is the smallest, easiest part of their duty. To be anything to irascible people under certain circumstances, particularly when demanding money rather urgently, requires a command of patience and temper possessed but by few, yet this is absolutely necessary to fill the much-coveted office.

Notwithstanding the duties of secretary and purser require a certain amount of knowledge of mining detail and practical experience thereof, as well as of the laws, customs, and usages of mines and miners, and the Cost-book System (if the concern be under that peculiar regulation), together with many other requirements, only to be obtained by long residence on or large experience in mines; yet no sooner is such a situation open, but it is applied for by persons of almost every grade in society and variety of profession, from the thoroughly practical, qualified man, who really knows the duties he proposes to undertake, down to the peripatetic attorney's or auctioneer's clerk, who would be as well qualified for and as readily undertake the office of Archbishop of Canterbury, or leader of the forces in the East, grounding their claims wholly on being able to write a good hand, and competency to keep books by double entry, knowing as little of the complicity, formula, or detail of the duties necessary in this as in either of the high dignities quoted; yet they vigorously urge, and pertinaciously assert their abilities to "soon get into" what they do not understand. That is all very well, but how are they to get into the good graces of their companions on the mine, or of the committees they serve (themselves requiring information), if they do not thoroughly know and can practise their duties? It is an office of considerable difficulty, requiring a certain natural adaptation to fill it satisfactorily, yet "fools rush in where angels fear to tread."

Sometimes, to get in the thin "edge of the wedge," salaries are accepted which appear simply ridiculous, in the hope of their being gradually raised, until they amount to something like a living value. Sometimes the situations are conferred on equally improper persons, by means of family or individual interest amongst the adventurers, when, as may be supposed, the remuneration is ample, and any slight omissions or faults overlooked. In the majority, however, in these as in all public appointments, favouritism and patronage prevail over ability or honesty, though the proper fulfilment of these offices conduces much to the harmony of proceedings in, and the welfare of the mine.

The duties of secretary and purser of such mines as have a London, or non-local management, are now usually divided, the pursership being commonly vested in the captain, who is provided with a clerk's assistance, to pay the merchants' bills, miners, labourers, &c., and receive the tin bills, &c., forwarding them and all vouchers to the London secretary proper. In others, a resident "mine agent" performs these duties for several mines, at a small salary from each, a decidedly advantageous plan, as it prevents the captain's time being too much infringed on by making out cost-sheets, paying men, &c., his work, if properly attended to, being quite sufficient to occupy all his time. Were such plans more generally adopted, and the number of mines superintended by one captain limited, fewer complaints of carelessness of measurement and absence of regular reports would be made. It is perfectly preposterous to suppose any captain, however clever, can superintend half-a-dozen mines, some of them miles apart, be continually reporting on others, and do justice to all; yet, such there are, to the manifest injury of mining generally. This subject is attracting the notice of many large mining capitalists, who make it a *sine qua non* that their captains and pursers undertake the management of no mines but such as those they are engaged in by them, nor allow them to mix themselves up by inspecting and reporting on other mines; they engage, and expect to have, their sole and undivided attention to their own mines, which is quite enough for one person, and they pay them accordingly. The same rule is being applied to secretaries of large mines, where also they are debarred from dealing in the shares, a very proper regulation.

The salaries for such purserships of small mines vary from 2*l.* 2s. to 3*l.* 3s. per month. Their task may be described as consisting of visiting the mine two or three times during the month, for the purpose of forwarding authentic statements to the principal office, to consult the captain if require any aid (such persons are usually practical miners, and quite equal to their places), to keep up the accounts on the mine, make out cost-sheets, attend on pay and setting-days, and to make out a monthly balance-sheet to be forwarded with the vouchers and receipts, thus considerably relieving the captains of such mines from, to them, the most puzzling and time-taking duties.

The multifarious services required of the "secretary proper" in London, or on the mine if the management be local, are but little known or understood by aspirants until the Rubicon be passed; they are of no easy or simple character even in the best and most prosperous mines. He has first to provide a well furnished, comfortable office, in some good eligible business situation (in London, or in the town in which the management is situated), to be there himself almost continually, if not, some properly adapted person instead, to answer a volume of questions by hourly-enquiring anxious shareholders, by whom he is expected to be as perfectly acquainted with the details, hopes, expectations, and probabilities of the mine's success as the captain himself; to answer numerous letters from distant shareholders to the same effect; to keep a complete set of books pertaining to the business of the mine, where from 5000*l.* to 10,000*l.* a year are turned over in wages and material, and where the name of every recipient of sixpence has to be entered; in addition to which are the report-book, into which the reports from the mines are copied, a book in constant requisition, and the transfer-book, also daily—nay, hourly—required by inquisitive shareholders; then there is the acknowledgement of transfer, and notice to new shareholders, altogether involving an amount of open work little appreciated or supposed; to issue notices for and attend all monthly, quarterly, general, or special general meetings, as well as their frequent adjournments; to be at the beck and call of the chairman and committee, and woe to the wight if the mine be making calls! He then has to apply, badger, tease, frequently to threaten, and prosecute some unfortunate adventurer, in doing which, even if successful, he makes him an enemy for life—though the fault be not his he is charged with it; if not he is sure to make enemies of the whole of the committee, who at once charge him roundly with want of energy or interest in the affairs of the company; it, therefore, behoves him to be firm but courteous. He, too, poor scapegoat! has to hear and bear the terrible biting sarcasms and reflections of disappointed shareholders, as well as the hasty, hot expressions of impetuous purchasers, if the prices of shares go down, instead of up, as they anticipated—remarks the captain is, by his absence, frequently spared. He, too, has to listen to the noisy, egotistic twaddle of every Tom Noddy who pretends to understand mining, whilst condemning the whole management from beginning to end; and because he has purchased a few shares in it, claims and noisily exercises his right to overhaul the books for years past, making more fuss and ado than all the other adventurers put together. Such a busybody Heautontimorumenos is to be found in almost every mine; and woe betide the secretary, purser, captain, chairman, or committee, as long as he is in it! Better is it to buy the knave out at once, or he will ruin the mine, and set all concerned in it by the ears. If the mine be prosperous all goes on smoothly enough; as long as dividends are payable the posts of secretary and purser, separately or united, are all that can be desired; the management then do not object to a trifle, or grumble if that personage be off the mine for a day's pleasure during the season; a very different version is put on all his acts. If any of the adventurers visit his residence, and partake of his hospitality, as far as it goes, he is in the one case a "splendid, liberal, right sort of fellow;" in the other, "something must be wrong, or he could not do as he does,—we 'll curtail his salary." Facts!

The post in most cases is one of considerable responsibility; very large sums of money are continually passing through the hands of these officers; in some mines they are constituted the treasurers, the money being lodged at the company's bankers at the call of the secretary, by whom cheques for such sums as are required being drawn by order of the committee, in which cases security to a considerable sum is required. Instances of defalcation to serious amounts do certainly sometimes occur, but they are very rare, perhaps more so than in any branch of business where similar sums are involved. The greater part of mine banking accounts are vested in the committee, by two of whom all cheques must be signed, as well as by the secretary, who, by signing these, renders himself liable to all sums withdrawn.

In Cornwall, the purser usually has the sole management of the mine and moneys (save the captain's office), and is frequently in advance to the mines many hundreds at a time. This plan has its advantages: as the secretaries there are generally well known men of substance, the bankers have little hesitation, and the men are regularly paid; whereas, under the former plan, if there be no assets, the committees are very unwilling to become personally responsible to bankers, the mines are thus inconvenienced by non-payment of calls, much to their discredit and injury. Many most honourable names are to be found amongst gentlemen holding these offices, celebrated alike for their integrity, ability as miners, high standing in society, and for kindness and affability to the captain and men. Among such stand the names of Taylor, Davey, Beckwith, Richards, and others, as beacons for example and imitation.

Such, then, are the duties and difficulties devolving upon all who would aspire to become secretaries and pursers: we now appeal to the reader if we have overdrawn the qualification, when we say it is necessary to be as wise as serpents and as harmless as doves.

And now committeemen, adventurers, consider well, when appointing your officer, what his duties are, what his qualifications and abilities should be, and in proportion grant him remuneration; be not false economists, but where you have a man emulous to become what the Taylors and the Daveys are, give him a salary to encourage him to do so, by which means you will not only raise your class of officers, but your mine itself, in the estimation of the public; as the ability and character of the secretary of a mine has a great deal more to do with its welfare than many persons suppose.

GEORGE HENWOOD.

Original Correspondence.

COLLIERY EXPLOSIONS, AND EDUCATION OF COLLIERS.

SIR,—The reverberation of the Lund Hill explosion is but faintly subsiding, before we are again saluted by the direct thunder of another explosion at Ashton-under-Lyne. In this case, however, there is room for congratulation, as the carboniferous demon has been less exorbitant in his exactions than he has been of late: only 39 lives have fallen a victim to his voracious appetite for human sacrifice at Hey's Colliery,—usually, of late, his demand has reached nearly 200 of the most valuable lives, irrespective of the claims of wives, mothers, or children. If any confidence can be placed in the judgment of juries, the cause of this fatal casualty is enveloped in the greatest mystery; as no one, it would seem, is able to suggest any probable origin of this awful visitation; for, after a long investigation, and examination of competent witnesses, the ventilation of the mine is pronounced excellent, and "how such explosion was caused it did not appear."

Such, then, is the verdict of the jury, against which I have nothing to oppose, beyond my conviction that the carburetted hydrogen did exist in the cavities of the mine, that it was saturated with eight times its volume of atmospheric air, and the compound thus formed was ignited by a flame the temperature of which was equal to, if not identical with, the temperature of the flame of a lamp or candle. This statement, I apprehend, cannot be impugned with success; and besides, it forms the only correct data which can be collected from the voluminous and desultory evidence respecting any explosions in coal mines. From such data I am at a loss to conceive by what steps of ratiocination any safety can be inferred by the use of locked safety-lamps. Would a careless collier be more cautious in the use of a locked safety-lamp than with one unlocked? Is a man fit to have the charge of a locked lamp in whose care it would not be prudent to place an unlocked lamp? Are there not, I ask, a great number of chances in favour of the flame coming in contact with the explosive gases besides that which follows by taking the gauze off the lamp? To how many liabilities of rupture is the wire gauze exposed by the workmen's tools, fall of debris, and position, is an important enquiry, which is far more difficult to answer, than to appreciate to the full extent the perilous positions into which a lamp may be placed by an unskilful workman? Will not the effects of the liabilities here alluded to be exactly the same in a locked as an unlocked lamp? There can be, however, no objection to a locked safety-lamp which is not equally valid with an unlocked one: it would be a great consolation to the hewer and putter if both of them could be safely dispensed with; but when the use of a locked lamp is advocated as a means of safety when working in the midst of explosive gases, then I conceive it is my duty to protest, in the strongest terms I can command, against such an erroneous conclusion, which cannot be justified by facts, nor correctly inferred from the collateral circumstances attending its use. The conclusion of the whole matter is this—however the interests of politicians and divines may clash, the collier must be trained mentally as well as physically, and thereby be made capable of greater responsibility in the discharge of his duties. This view of the subject is entertained by many wise and experienced men; still, there are those high in social position, and distinguished by their abilities, who appear to think that the intelligence of the collier is incompatible with discipline, and working the mine in safety. The celebrated viewers appointed to take charge of the consequences of the Lund Hill explosion recommended "that no discretionary power should be allowed, but that discipline should be rigidly maintained." Without the meaning of this phrase is limited indeed, it recognises in the unfortunate collier a passive obedience not more luminous certainly than that which is exercised by the Russian trooper, and ignores completely the idea of education amongst this class of the community. I rejoice that such sentiments as these are not in unison with the genius of enlightened Englishmen, whose views on this subject have been expressed by the Rev. Canon Moseley, on the occasion of distributing prizes and certificates to the students of the Bristol Mining School.

The increasing explosions of late have stimulated the attention of practical and scientific men, with the object of discovering some means of diminishing their frequency, and neutralising their baneful effects. My earnest prayer is that such labours may be approved and crowned with success. The various trains of thought into which men have been led have been suggested by the two following propositions:—1. How can a lamp be constructed so that the colliers can use it conveniently and safely, in spite of their carelessness and want of judgment?—2. By what means can the judgment, caution, and prudence of the colliers be augmented, so that they can use the limited means at their disposal with the greatest possible advantage in neutralising the numberless casualties to which they are daily exposed?

These propositions tacitly admit the existence of explosive gases, and that no amount of ventilation—which, by-the-bye, is nevertheless of the utmost importance—can at all times, and in all places, sufficiently dilute and carry away in safety. Explosions occur more frequently, and with greater violence, than they did before the question of ventilation had received such an extraordinary development by the profound and delicate researches of the various Committees of Lords and Commons. Of course, every idea, fact, and inference must be gilded before they can be presented to the Committee of the House of Commons, from which, after mature deliberation, they issue forth, having all their oxides and other impurities completely dissolved by the caustic eloquence which there prevails. It is true that witnesses are examined who ought to know a great deal about ventilation, but when they are critically questioned their knowledge of its fundamental principles is very limited indeed, many proofs of which may be found in the Blue Books themselves.

That the ventilation of a mine must increase eight times as fast as the yield of carburetted hydrogen, in order to preserve it in safety, is a fact not sufficiently prominent in the discussion of this important question. In my opinion, one great means of diminishing the number of explosions will be found, in conjunction with the moral elevation of the miner, in the diminution of the number of receptacles for explosive gases—places in which but little air can travel. This object can be attained by promoting the system of long work, which can be carried out economically, without the necessity of bending the current of ventilation into a hundred thousand different directions, which mightily prevails in the pillar and stall work. With respect to the progress which has been made towards a satisfactory solution of proposition 1, Mr. Binney, of Manchester, than whom no one is a better judge, declares that but little improvement has been accomplished since 1816; and for simplicity, utility, and cheapness, the Davy lamp is without a rival.

Thomas Cook, Esq., F.R.S., Professor of Fortifications at Addiscombe, has recently invented a lamp for miners, and though I cannot see in what way the details of his plan can be adopted with advantage in practice, still I have no hesitation in stating my conviction that the construction of the lamp involves a principle of vast importance, and one that will admit of a variety of transformations to meet the artifices and suggestions of thinking mechanicians. The report of the Bristol Mining School shows that the solution of the second proposition is not entirely neglected. My wish is that this institution may meet with that success which the zeal and ability with which it is conducted richly merit.

COAL MINER.

Aug. 12.

COST OF POWER.

SIR,—In my last letter on this subject I compared the relative cost of work done by steam, by electro-magnetism, and by the labour of men and horses; but I did not include the cheapest of all motive powers—air and water. Air is, as a motive-power, literally free as the wind, the only expense being interest on cost of mill and attendance. The interest on the first outlay was not considered in the other cases, and as the attendance upon the working part of the mill suffices for attendance on the motive-power, we may consider the art of air as a power to be nothing; it is, however, too variable and uncertain to be used for many purposes, mining among them, although the remains of the building at the top of Kit Hill, near Callington, show that it was formerly used.

Neither can the cost of water as a motive-power be given; it should, like air, be free, but independently of the heavy outlay sometimes necessary in the first case to procure water-power, there are frequently large sums to be paid annually for its use. Mr. Glynn, in his treatise on the power of water, states that in many parts of London 1000 gallons of water, at a pressure of 150 ft., can be had for 4d. This, of course, would be available for motive-power, and would cost 6d. per horse-power per hour, or allowing for loss of power in transmission would probably cost 8d. per hour; and at Nottingham, where water is supplied to large consumers at 3d. per 1000 gallons, and is raised 300 ft. above the Trent, the cost per horse-power per hour would probably not exceed 3½d. In the former case, comparing this with manual labour, it would be about 1s. 4d. for a man working 12 hours; in the latter only 7d. At Newcastle, the machinery for printing the *Newcastle Chronicle* is worked absolutely without any loss of useful power—the water, in its passage from the higher to supply the lower part of the town, communicating motion to the whole by a pressure-engine. Newcastle also, I believe, was the first town in which the public supply of water was used for the purpose of working hydraulic cranes, which have since been so commonly applied. In cases where water under high-pressure is used for working machinery to a small extent, the handiest way of applying it would be, perhaps, by a small

overshot wheel, with six radial floats working in a water-tight box, a model of which, adapted to a winding-engine, may be seen at the Museum of Economic Geology.

It would probably be found that the general cost of power by high-pressure water in this manner would be about half as much again as the cost of the steam-power that raised it in the first instance; thus, supposing that by the water-works 80,000,000 units of work cost 1s., 54,000,000 per 1s. would be the cost of the water-power; but, of course, in those cases where high-pressure on the water is obtained by a natural difference of level the cost would be very small.

Though the cost of water-power cannot be given in a general way, like that of steam or horse-power, it may be well to consider the useful effect of the various machines worked by water, as compared with the actual power of the water itself, and this is a point which in this country has, perhaps, been hardly enough attended to. It is commonly stated in works on the subject that the ratio of effect to power, or the modulus of overshot wheels, varies from 0·60 to 0·80, of breast wheels from 0·45 to 0·50, and of undershot wheels from 0·27 to 0·30; but it will be seen that within these limits is precisely the difference between a well and badly-constructed wheel. With regard to undershot wheels, indeed, it is well known that Poncelet's wheel, with curved floats, instead of 0·27 or 0·30 has realised 0·70 of the total power; yet this wheel is almost unknown in many parts of the country. The whole class of horizontal wheels also have been shamefully neglected, notwithstanding their well-known and well-proved success both on the Continent and in America. Mr. Francis, in his account of hydraulic experiments at Lowell, states that Mr. Bogden agreed to erect three turbines for the Appleton Company—that by agreement he was to receive for his designs $12,000, if the modulus of the wheels amounted to 0·78, and $400 for every 1 per cent. above 78; and that on careful and accurate measurement their efficiency was found to be 88 per cent. of the whole power. Now, if mining companies and others erecting large hydraulic machines in this country were to make similar agreements, it would very soon and very much improve this branch of practical science. The registration of the duty (imperfect as it is) of steam-engines has, there is no doubt, been one of the chief causes of the great perfection to which Cornish engineers have arrived, and when the modulus of every wheel of considerable size is measured, registered, and published, then, and not till then, will hydraulic science make equal progress. It is not practicable with a water-wheel to keep a constant register, like in the case of a steam-engine, as the quantity of water delivered in a certain time is constantly changing; but there is no difficulty when a new wheel goes to work in gauging the water expended in a certain time, and in measuring the corresponding effect produced. Excellent details on this subject will be found in the work before alluded to, by Mr. J. B. Francis, entitled, *Lowell's Hydraulic Experiments*.

Though one of the great advantages of the turbine is that it can work at varied velocities without impairing its efficiency (in those above alluded to there was only a difference of 2 per cent. in the efficiency, when the velocity of the circumference varied from 50 to 70 per cent. of the velocity due to the head of water), yet I do not think that, as a general rule, they can work at a sufficiently low velocity to be adapted to pumping-engines; but nothing can be better adapted for stamps or dressing-machines, where they could work without any multiplying gear, and be erected at a small first cost.

Reaction wheels (of which the well-known Barker's mill is the type) are frequently confounded with turbines; the difference is simple, the latter travelling in the same, the former in an opposite, direction to that in which the water escapes. Their efficiency varies from 60 to 70 per cent. of the power; Whitelaw and Stirrat's patent wheel is said to produce 0·75.

Water-pressure engines—that is, engines with pistons and cylinders exactly similar to steam-engines, only working by water instead of steam-pressure—are an excellent class of machines, and by no means so common as they deserve to be. They are particularly adapted for working underground in mines where there is power enough at surface to raise the water used. There are two at the Alport Mine, near Bakewell, Derbyshire—one with a 50-in. cylinder, 10-ft. stroke, 132 ft. head of water, equal to about 168-horse power, doing 0·70 duty, and stated by Mr. Darlington not to cost 12*l.* per annum for repairs, oil, &c. The other has two cylinders, 24 in. each, 10-ft. stroke, 130 ft. head of water, equal to 140-horse power, and doing 0·85 duty.

Hydraulic rams, for raising part of a running stream by its own momentum, are machines of great antiquity, and certainly not so commonly used as they might with advantage be; their efficiency is from 0·60 to 0.70.

In conclusion, I would strongly advise all persons about to erect hydraulic engines of any kind to imitate the Lowell Company, and pay by agreement, according to the efficiency of the machine; this, and a system of registration, would soon improve our knowledge of water-power.

3, *Beaumont-street, Aug.* 5. A. H. Patterson, C.E.

P.S.—Your Devonshire readers may like to know that a reaction wheel (Whitelaw's patent) may be seen at a farm of the Duke of Bedford's at Marystow, near Lifton, working with about 37 ft. head.

FORMATION OF HARBOURS, AND USEFUL EMPLOYMENT OF CONVICTS, &c.

Sir,—These vital and all important subjects, so ably noticed in the Journal of last week, will, I am afraid, share the fate of all and every attempt to do good, until a complete social revolution, if not a physical one, set things right for real work, in place of the idle gabble of "talk of doing things," which are then considered disposed of by passing into sub-committee meetings, who go over the old yarns, and spin them into a web or net of difficulties.

Will anyone say we have arrived at anything like a conclusion with Government or local managers in providing work for convicts and ticket-of-leave men, to say nothing of the great talk, ending in nothing, of the Mansion House meeting? A fearful risk is running, and dire will be the consequence of leaving these depraved and (doubtfully) reformed characters to shift for themselves as they can; but still worse will it be for our honest and industrious working classes if a severe winter sets in (a very probable event), and no provision made for them, except such as the workhouse and jails will afford. The points, as they now present themselves, are—Shall the men support themselves, or must the poor and county rates be increased to maintain them in degradation?—for such it is to every honest man, poor though he may be, who prefers earning his own livelihood.

I have appealed to Members of Parliament, &c., but they are all too busy "doing nothing," or it is too early, or too late, or too something else; and all their vaunted brag and bombast on the hustings of being friends of the people, and friends of the working classes, is like the soapsud and pipe-blown bubble—very pretty until blown on, when nothing is left to look upon. In God's name, when are we going to work like men and Englishmen, determinedly and honestly, for the country's good? I hope shortly, for God will help those who will help themselves rightly. Pray use your powerful editorial pen to rouse up a spirit of action and work, to prevent the otherwise certain evils, miseries, and annoyance of the coming winter.

Wandsworth-road, Aug. 12. W. Austin.

TRIAL OF PATENT CAUSES.—No. IX.

Sir,—Although I had hoped that my former letters on this subject would have elicited some discussion in your Journal, yet perhaps it is some consolation to be able to infer from the silence of your readers that no palpable absurdity has been broached. But the criticisms that have reached me afford some ground for believing that much more has been thought than expressed in writing on the subject of my proposal. And these criticisms, at the same time, lead me to believe that some good may yet result from a further explanation and development of my suggestions.

Now, it may serve to clear the ground a little if I at once advert to a few objections that have been raised, and show from them what I do not mean to advocate:—

1. It has been said, that in order to get a trustworthy report on the science of a case it will be necessary to call in the aid of great scientific celebrities, who will charge a great deal for their services, and this will be in addition to the ordinary cost of a trial at law.

This objection assumes the necessity for treating the science of all patent causes in the manner which has become usual, owing to the facilities afforded by the present system for a public display of scientific gladiatorship. It assumes a sort of German mode of treatment, by going over a vast amount of preliminary matter, which to ordinary minds has a scarcely appreciable bearing on the real points in dispute.

I deny this assumed necessity, believing, with a forcible writer of the present day, that in many cases the British mode of taking up a subject in the middle is far better for practical purposes than the German mode of taking it up at the beginning. And certainly this is true in the science required to be tried in ordinary patent causes. The mysterious thing to be dealt with is a *manufacture*, having an assignable origin and date: and for the purpose of ascertaining what it is according to the terms in which it is specified, as well as what it is in fact, and whether it be new, as asserted on one side and denied on the other; also whether the ground covered by the patent in question has been invaded or not, as alleged and disputed. Surely for this purpose it cannot always be necessary to go into recondite points of abstract science. It is ever to be remembered that a point of abstract science, *per se*, is not patentable, and the science to be determined is that on the thing patented.

But in further reply to the present objection, I would urge the consideration, that the scientific enquiry, as proposed, is not analogous to those in ordinary trials of patent causes, inasmuch as these follow the course (it may be a very tortuous one) of the pleadings, while that is intended to form the initial of the trial. Instead, therefore, of the proposed enquiry taking its shape from its necessary subservience to artificial rules, and thus being made to include a large quantity of extraneous (often confusing) matter, it would have to deal only with the facts in issue, presented in the most direct terms that the case would admit of. It would also be divested of any complications as to legal rights of parties, the settlement of which would be reserved for the court and jury, according to the law and evidence.

I lay particular stress on the point that there is an essential difference in principle between the proposed scientific enquiry and that at present adopted, in this respect—that the former refers solely to the determination of the premises for the argument, while the latter takes the premises and argues according to them. I trust hereafter to be able to show that the point of carefully settling the premises deserves far more attention than it has ordinarily received—that it is, in fact, the main point to be considered in all cases, because on it depends the right understanding of the case by the court. And what I desire emphatically to assert is, that this point is not, and cannot be, duly considered in the present mode of trying patent causes, and that my chief object and effort is to try to effect some improvement herein: so that the test of the value of my suggestions will lie in their tendency to promote this end.

Now, here I would pass to the consideration of another criticism, but that I think it advisable not to disturb, for the present, the impression that may be left on the mind of the reader as to what constitutes my principal aim, since it appears to me that a clear apprehension of this is essential to a correct appreciation of my proposed plan.—*Office for Patents, 50, Chancery-lane, Aug.* 4. Wm. Spence.

PRESENT POSITION OF AUSTRALIA, AND ITS GOLD MINES.

The great interest which is now felt in the progress of Australia has induced the publication of an elaborate and highly-interesting work, entitled "Victoria and the Australian Gold Mines in 1857," by Mr. Wm. Westgarth, late Member of the Victoria Legislature. The author, after briefly referring to Victoria in its aboriginal condition and its colonisation, enters upon the progress in road and railway making, telegraphing, &c. He considers that there were two natural sites within Port Phillip which were superior for the purposes of a capital to that of Melbourne—Geelong (after the moderate difficulty of cutting through a bar at the entrance to the inner harbour) and Williamstown, where there was no such difficulty, and where a dry and level ground offered great facilities for the progress of a commercial town. Melbourne, however, with the favourable prestige of its being the capital, the public improvements, and the wealth and enterprise of the citizens, has overcome the deficiency of situation. The export and import business was for a time powerfully competed for by Geelong, but at length the centralisation tendencies of Melbourne have prevailed, and but a small and unimportant part of the annual commerce of the colony escapes elsewhere.

Upon the subject of gold mining he says, that within the last two years "rushes" have all but disappeared, and gold digging has assumed the character of one of the regular and fixed vocations of the colony. The quantity of gold raised from the mines in 1852 has been estimated to exceed that of any subsequent year, although the mining population numbered from a half to a third only of what it afterwards attained. An *esprit de corps* still survives, although with expiring energies, which proscribes the employed labour of capitalists and companies, and summons the patriot digger to work on independent account for the precarious 10s. per day rather than accept the servile pound of a capitalist master. Time cures all these conceits, and employed labour is now rather the rule than the exception upon the gold fields. To some extent it is due to this prejudice that public companies, capital, and machinery have as yet done little for the gold fields of Victoria; but so far as these associations have been tried they have improved the employed miners' condition.

One of the Anglo-Australian mining associations—the Port Phillip and Colonial Gold Company—complain that the mining laws and miners' prejudices are among the causes of its non-success. The Chairman, at a late meeting in London, stated that—"Australia was the only country in the would where protection was withheld from mining companies and their servants." The grounds for this complaint still, to some extent, continue, although happily by degrees giving way. It is a subject for time as well as for judicious government. The political consideration lately given to the gold fields has already operated beneficially. While these hives of industry had no political representation and no local institutions, they were a prey to stump oratory, which instinctively cherised the interests of the resident miner, and proscribed the foreign non-resident or the non-labouring capitalist. The local courts where, under a Crown-nominated chairman, the elected members now frame their own mining regulations, are the effective schools where the miner is now being cleared of his prejudices; and where also his own views of the question have due consideration; for his opposition to the insatiate grasp of capitalist association is not always either in prejudice or ignorance.

Quartz-crushing attracted but little notice for the first two or three years of the gold fields. Here and there was a solitary effort, but the machinery was so weak and ineffective that after a trial the work was generally abandoned. As it began to be known, however, that the quartz rock was not only practically limitless in quantity, but also rich beyond the experience of any other country, the trials abandoned by one party were soon resumed by another. From 3 to 7 ounces of gold to the ton of quartz seemed quite an accessible prize. The extra richness of occasional veins further stimulated the work, as some of these literally sparkled with gold, and were so charged with the metal that a common hand hammer might have been employed upon the quartz with good results. Quartz-crushing by companies is now nearly abandoned. The great cause of failure has hitherto been not the unproductiveness of the quartz, but the inadequate machinery, both as to its scale and its ineffectual handling of the quartz. The result, for the present at least, has been with this, as with many other businesses, that it will remunerate those only who make it their own vocation, and who are personally on the spot—in short, the resident miners, and by these the quartz-crushing is now carried on to a large and increasing extent.

Passing over Mr. Westgarth's excellent account of his tour to the Victorian diggings, and his visit to Mount Alexander and Castlemaine, we come to his description of the Bendigo diggings, in which he remarks that here, as almost everywhere in Australia, there was the want of water, without which no scenery of extensive compass can be complete. The dryness of the season had much reduced, or entirely evaporated, even the water holes that bespeck the valleys and plains hereabouts. They are not of any great magnitude, no considerable river course having crossed their path; but although too tiny a feature to give character to scenery, they are anxiously recognised by the interior settler, who associates with them the success of his business and the support of life. The quantity of rain in Australia, one season with another, being quite sufficient for all useful purposes if the supplies were but husbanded, the time will soon arrive when the rich diggers and others will give attention to the damming up of creeks and valleys, and thus improve alike the scenery and resources of their country. In the midst of the hottest summer, a smart rain, that has extended throughout the colony, produces an immediate and surprising effect in tempering the climate, an effect that disappears only with the gradual re-desiccation of the surface. The multiplying of small sheets of permanent water over the surface would partially communicate the same effect, and thus permanently temper the great inequalities of an Australian summer. The country is considered favourable in its physical features for these important operations.

Auriferous quartz was in the greatest abundance, and the officer in charge gave a glowing picture of the hidden wealth connected with this material; these statements have since been more than verified, and quartz-crushing, both at Bendigo and a dozen other places, has already attained the height of a mania. In the machinery there appeared a great want of power and ability to produce the necessary fineness in the grinding of the quartz. After describing Anderson's Creek, and other gold diggings, he concludes with a description of the social features, politics, finances, and legislation of the colony; and appends some overland notes of a readable and popular character.

Mr. Westgarth's work, taken as a whole, cannot fail to prove well worthy of perusal by all concerned in the affairs of our Australian colonies; and from the admirable style in which all questions of dispute between conflicting interests are treated, there has evidently been an earnest desire to be impartial; and we think that neither party can complain that any statement has been put forth, which is calculated to prejudice their cause, without adequate authority.

THE MINERAL WEALTH OF IRELAND.

Mr. Joseph Holdsworth, an old and much esteemed correspondent of the *Mining Journal*, has just completed his history of the "Geology, Minerals, Mines, and Soils of Ireland," which is written even in a more popular manner than usual. With regard to Ireland's dawning prosperity, the genial sun of a manifestly providential visitation is now fairly above her horizon; its revivifying rays have already called into life and activity the latent forces of civilisation which have for untold ages lain dormant within her prolific womb; they are rapidly dispersing the hitherto stagnant mists, and removing those foul blotches—moral, social, and political—which, during the protracted period of a chastening ordeal, affixed themselves like vampires upon her, to the great exhaustion of the life blood of her national existence, and to the sad disfigurement of those physical features which Nature herself has rendered so eminently attractive.

Amongst the native metallic ores exhibited in the Dublin Exhibition are some fine massive specimens, deposited by the Mining Company of Ireland and others, consisting principally of argentiferous copper ores, silver-lead ores, and iron pyrites, chiefly from the counties of Down, Galway, Mayo, Leitrim, Dublin, Wexford, Waterford, Wicklow, Cork, Limerick, Clare, and Kerry. There are four considerable tracts of granite in Ireland. The first commences at Kingston, and runs south through Wicklow and Carlow to New Ross in Wexford: it is surrounded by the slate, except a small breadth of clap, or middle limestone, and a narrow strip of the lower carboniferous limestone, which crops out near Athy, Carlow, &c., from beneath the Kilkenny coal fields. The Wicklow mountains, including the clay-slate ranges, run south-south-west from Dublin Bay to the junction of the Suir and the Barrow, near Waterford. The Wicklow mines have for the last 15 years produced a large quantity of iron pyrites, worth 15 per cent. for sulphur: 100,000 tons per annum have been raised, and this quantity is capable of increase. This ore has been substituted for Sicilian brimstone by alcali manufacturers, and has become an important industry, giving employment to a large number of hands. Besides pyrites, green and white lead ore and galena exist in considerable abundance. About 30 copper mines and 20 lead mines are working in Wicklow. Towards the close of the last century native gold was found in considerable quantities, disseminated in the beds of rivulets and streams descending from the Kinshela Mountain, about the junction of the granite range with the Silurian slate rocks; this granite consists of quartz, chlorite, and albite, while the potash granites of the main chain consist of quartz, orthoclase, and margarodite mica. The gold occurred chiefly in minute grains, but occasionally in nuggets, one of which weighed 22 ozs., and others 18 ozs., 9 ozs., and 7 ozs., respectively. It was first discovered by the country people, and it was calculated that 10,000*l.* worth was disposed of before the fact became generally known. Subsequently, Government collected 945 ozs., but the returns barely paid cost, and working for it has since discontinued.

The copper mines in the upper slate and carboniferous limestone in the neighbourhood of Castletown and Berehaven afford employment to some 2000 persons. There are some other valuable copper mines at Crookhaven, Skibbereen, Ballydehob, and many other places along the shores of Cork: the ores consist of purple, yellow, and grey copper. The Kenmare valley is intersected by several very promising copper and silver-lead lodes, some of which are now working. The Ardtully Copper Mines, in this valley, have been in more or less successful operation since 1838, and give employment to upwards of 100 persons. The great coal field of Munster is mainly composed of the lower members of the coal strata, with occasional beds of anthracite, the whole reposing on the millstone grit and upper limestone. The Irish coal fields contain three principal beds of anthracite and four of bituminous or flaming coal; the former being raised in the southern districts, and the latter in the counties north of Dublin. In the Tyrone coal tract an abundance of brown hematite or bog ore is found, which yields about 57 per cent. of iron.

Although the bituminous coal fields of Ireland, as far as their contents are yet known, would appear incapable of permanently supporting extensive smelting establishments, some few of them contain ample stores. It was stated by Mr. Griffiths in 1824, before a committee of the House of Commons, that in the district of Lough Allen, in Leitrim, there were still remaining 8000 English acres of good 3-ft. coal, particularly exempt from water, which would yield upwards of 30,000,000 tons. He further stated, in reporting on the Fowlerton Colliery, Castlecomer, that "although considerable workings had been made and pits sunk, no coal, except that lying near the surface, had been worked, the best and most solid part still remaining untouched." This anthracite basin contains eight beds of coal. The supposed number of acres of workable coal is—in Ulster, 500,000; Connaught, 200,000; Leinster, 150,000; Munster, 1,000,000. The paramount position, power, and prosperity of Britain is mainly owing to the vastness and available value of her mineral treasures; and obviously her domestic interests can hardly be more effectively served than by the discovery and due development of these grand elements of success and progress in every corner of the kingdom in which, in any sufficient shape or character, they may exist. It is then, assuredly, a wise policy not only of the State, but of the proprietors of mineral lands, to give due encouragement to mining enterprise, and every reasonable facility to the efforts of the adventurer. A spirit of liberality and fairness is, perhaps, more especially desirable in the Irish landlord, for by its adoption he best consults his own individual interests; and more, he very effectively serves those of his compatriots, in thus rendering the first essential towards the spirited development and useful diffusion of the boundless mineral resources of his native isle.

It is estimated that the Irish peat bogs occupy a total area of 2,830,000 acres, and vary in thickness from 12 to 40 ft. Dr. Macculloch has enumerated nearly 40 plants which concur to the generation of peat, besides the *sphagnum palustre*—a plant which very distinctly exhibits the process by which the vegetables are converted into peat. As the lower portion of the plant dies, the upper portion is renovated, thus continually preserving its existence, and not unfrequently causing a yearly growth of peat bog of from 1 foot to 2 feet. Where the living plant is still in contact with the peat, the roots of the rushes and ligneous vegetables are found vacillating between life and death, in a spongy, half decomposed mass; lower down, the pulverised carbonaceous matter is found mixed with similar fibres, still resisting decomposition; these gradually disappear, and at length a finely powdered substance alone is seen, the process being completed by the total destruction of all organised bodies. The quantity of peat is much affected by the wetness or dryness of the soil, elevation, &c., which influence the temperature and moisture of the atmosphere. Although peat was employed as a fuel as early as 1560, it appears that there is still room for improvements by which to utilise the valuable products which it contains.

We think, after carefully reading Mr. Holdsworth's work, it cannot be doubted that he has accomplished his task in the most satisfactory manner, and fully proved the capabilities of the country, both from its surface and underground riches, to become one of great industrial importance—skill and capital being the sole requisites for effectually developing its immense resources.

INSTITUTION OF MECHANICAL ENGINEERS.

At the August meeting of this institution, held at Birmingham (Mr. W. Fairbairn, Vice-President, in the chair), several papers of an interesting and useful character were read, of which we subjoin an abstract.

Mr. J. Inshaw, Birmingham, in his description of an improved pressure gauge, states that the gauge is constructed of two flat steel pressure plates or discs, between which the pressure is admitted, and bulges or deflects the two plates in opposite directions, a double amount of deflection being thus obtained for a given pressure, compared with gauges having only a single pressure plate. The deflection is communicated to the index from a pair of levers in contact with the two plates, by means of a toothed curved rack gearing into a pinion on the spindle of the index; and the levers are adjusted by means of the mode of constructing the gauge, so as to give a uniform graduation upon the dial. The joint between the pressure plates is made steam tight by an india rubber packing ring, confined round the circumference by a thin copper ring, to prevent it from spreading outwards when the plates are screwed up tight upon it. The steel pressure plates used in the gauges are hardened and tempered, and then planished and set perfectly flat, and electro-plated with copper to prevent oxidation. Nearly 400 of these gauges are now at work, varying from vacuum gauges up to a steam-pressure of from 10 to 200 lbs. per square inch; about 50 of them have been in regular use for upwards of 12 months, and have proved entirely satisfactory. Several specimens of the gauges were exhibited, and of the pressure-plates, levers, &c., of which they are composed; and, also, a specimen of a registering pressure gauge, for registering, by means of a second index, the maximum pressure that has been attained during any period, so as to show whether the limit of working pressure allowed in the boiler has been exceeded.

Mr. J. C. Kay, Bury, described three varieties of safety-valves, in the first of which a large-sized conical valve is fixed on the bottom of a hollow tube or stem passing upwards through a fixed diaphragm or partition, which serves as a guide to it; on the top of the tube is fixed a piston, working in a steam-tight cylinder. The steam passes up through the hollow stem, and pressing down on the piston keeps the valve closed, the area of the piston being rather larger than that of the valve. Whenever the pressure exceeds the working limit, the steam raises a small supplementary valve, by which it is admitted to the underside of the piston; the piston is then in equilibrium, and the upward pressure of the steam on the valve being no longer counteracted by the pressure on the top of the piston, the valve is lifted, and the steam escapes, continuing to blow off freely until the pressure has fallen again below the intended limit. In the second form of valve the conical valve is replaced by a ball valve, and the construction of parts is modified to suit this alteration; the valve then serves in addition as a vacuum valve, admitting air into the boiler whenever the pressure falls below that of the atmosphere. The third form of safety-valve is intended to serve as a protection both against excess of steam-pressure and against low water in the boiler: it consists of a large sized conical valve, on the upper side of which is a disc of rather larger diameter, the effect of which is that when the valve is slightly raised by an increase of pressure beyond the limit to which it is loaded, the steam then acts on the larger area of the disc, and the valve is lifted considerably higher, giving a large opening for the free escape of the steam. To render the valve a protection also against low water, the valve spindle or stalk is carried down into the boiler, and from the bottom of it is suspended by a pivot a horizontal lever, carrying a float at one end and a balance weight at the other, the two forming the load of the valve. This lever is furnished with a second pivot, situated between the float and the valve spindle, at a short distance from the latter. In the event of the water falling too low in the boiler, this second pivot comes to a bearing in a fixed stirrup suspended from the roof of the boiler, and the load is thus taken off the valve spindle, so that the valve immediately rises, and the steam blows off. About 100 of the valves are now at work, principally of the third form, which is most preferred, and most extensively in use.

Mr. J. Wilson, West Bromwich, gave a description of a new convex plate laminated spring. In the new springs, the plates, instead of being plain flat plates, as hitherto used, are rolled with a transverse curvature or convexity, in an inverted trough form, by which an increased stiffness is imparted to them, similar to the stiffness of corrugated as compared with flat iron. The increased stiffness of the plates enables them to be made of thinner steel, rendering them considerably lighter than the ordinary springs; and with the same amount of elasticity or deflection per ton, the convex plate springs save from one-quarter to one-third of the weight of the ordinary flat plate springs. The convex form of the plates also obviates the necessity for studs and slots at the ends of the plates, to prevent them working askew upon one another, the convex top of each plate sliding in the groove formed by the concave underside of the plate above; and in place of the ordinary fixing bolt or rivet passing through the centre of the plates and clip, a small fixing pin is driven down at one side of the spring, having a little less than half its thickness in a notch in the edge of each plate. By this plan, the strength of the plates is preserved uninjured, instead of being reduced to the extent of from 7 to 14 per cent., as is the case with the ordinary centre pin. The new springs are employed for railway bearing and buffing springs, and also for common road vehicles, and have proved fully successful. A number of the springs of the different descriptions were exhibited, with specimens of the plates, and a double elliptical spring was shown in action by means of a lever.

An abstract of a paper read at the previous Manchester meeting, by Mr. Joseph Whitworth, the president, on a standard decimal measure of length for mechanical engineering work, was next heard. It this paper it was urged as a highly desirable step that a decimal system of measures for mechanical engineering work should be introduced, and that engineers and machinists, instead of thinking in eighths, sixteenths, and thirty-seconds of an inch, should think and speak in tenths, hundredths, and thousandths of an inch. It was observed that no exact meaning can be attached to such sizes as "a bare sixteenth," or "a full thirty-second;" and much inconvenience may arise from the different notions of different workmen as to the value of these expressions. With the decimal system of notation, in which small differences of size can be expressed in terms conveying an exact value to the mind, the importance of minute and accurate measurements would become more familiar, better appreciated, and more generally applied; and many operations would by that means be more easily and effectually performed. In introducing the decimal scale, it is desirable to use rules having the inch divided into tenths and their subdivisions, which would soon become as familiar to the workman as the eighth scale now used. In the case of the wire gauge, in place of the confused and uncertain notation hitherto in use, it is proposed to adopt a scale commencing with the smallest size, and increasing by thousandths of an inch up to half an inch. At present there is no standard of appeal; and the different wire and other gauges vary so considerably, that the manufacturer, in the case of small wire and sheets of metal, has to send a sample of what he wants, there being no means of correctly expressing its size. In the new wire gauge scale it is proposed to call the smallest size No. 1, being the 1-1000th of an inch; No. 2 being 2-1000ths, and so on; increasing up to No. 20 by 1-1000th of an inch; from No. 20 to No. 40 by 2-1000ths; and from No. 40 to No. 100 by 5-1000ths. The present No. 36 gauge is proposed to be called No. 4, being 4-1000ths of an inch; and the present No. 16 to be called No. 65, being 65-1000ths of an inch. The sizes will thus be called simply by their expressive numbers—a change which will render the new scale easily intelligible.

MINING LAMPS.

The following is a more detailed report of the paper read by Mr. E. W. Binney, at the Manchester Geological Society, which was briefly noticed in our last Journal:—

Since the discovery of the lamp by Sir H. Davy, in 1816, when I produced a light enclosed in a cylinder of wire gauze, 8 in. high and not more than 2 in. in diameter, the wire being when twilled not less than 1-40th of an inch in thickness, and 30 in the warp, and 16 to 18 in the weft, and when plain not less than 1-60th of an inch in thickness, and from 28 to 30 both warp and woof, little has been done in the way of improving it. In common use throughout the United Kingdom the lamp is pretty much the same as when it came out of the hands of the inventor. For simplicity, utility, and cheapness, the lamp will, in the opinion of most practical men, be preferred to any yet introduced. The inventor especially cautioned workmen against allowing the gauze cylinder to be heated to dull redness, and moving it against a strong current of air. He saw what we all now know after 30 years' experience, that the Davy lamp was a safe instrument in the hands of a careful man who knew the principles on which it was constructed. It never was his idea that it was to be opened and closed like the door of a common lantern in the open air, placed on the sloping floor of a mine, with dry coal dust on the outside, and oil spilled on the gauze in the inside, moved swiftly against a strong current of an explosive mixture, or placed under a falling mass of coal, and crushed into all kinds of shapes. Yet it is well known that the lamp has been subject to all these varieties of hard usage, and very unreasonably expected to prove a safety lamp.

I will now notice several lamps which have been more or less in use:—

1. That invented by the late George Stephenson, a man equally eminent in practical as Sir. H. Davy was in theoretical science, and who, without doubt, produced a mining lamp before the latter philosopher. This lamp in its most complete state, when it was known in the north by the name of the "Geordie lamp," was like a common Davy, with a wide glass cylinder in the inside and close to the gauze. It has never been in great use, owing to the glass being liable to break, and from its going out in an impure atmosphere sooner than the Davy. So long as the glass is entire the lamp must be safer than a Davy, and when broken it must be as good as that lamp, but still the opinion amongst workmen has been that when the glass was broken it was not safe.

2. The Upton and Roberts' Lamp.—This has the gauze in the inside of the glass in-

dized of the outside. Like the Geordie, last named, it is liable to go out in a foul atmosphere sooner than a Davy. It is no doubt a safe and useful lamp, but its expense is greater than that of the Davy, and its increased cost is not compensated for by its greater safety.

3. The Solar Mining Lamp.—This has never been in general use. It consists in placing a solar lamp inside of a common Davy. The gauze was of a dangerous width, being nearly 3 in in diameter—a very serious fault in a mining lamp.

4. Clanny's Lamp.—This is a lamp with the gauze within the glass. It has come into considerable use in the North, but many parties object to the glass on the outside, being liable to be broken, and the light going out in an impure atmosphere.

5. The Museeler or Belgian Lamp.—This is in considerable use in Belgium, but it has not progressed much in England. It is a light simply enclosed in glass, and consequently not near so safe in general use as the lights protected by glass and gauze.

Besides the above an immense number of new lamps have been introduced, but I merely allude to these five in order to show such as have been introduced into a mine and had a fair trial by ordinary use. In most of them it will be seen that the pricker to trim the wick is in the same rude state that Sir H. Davy left it. Mr. Sherwood, of Birmingham, has brought out a lamp having a glass chimney in the inside of a wire gauze, something similar to the lamps of that class above-mentioned, but the wick, which is a flat one, and the burning apparatus, is quite different to that adopted in any of the above lamps. The wick takes up by capillary attraction a light oil (Young's parrafine or mineral), and passes through a flattened tube, where it is capped with a brass nozzle, having a long slit in the top and plenty of air holes in the sides. When the wick is lighted a great current of air impinges on the flame as it passes through the slit in the nozzle, and thus insures a perfect combustion, such as has not hitherto been effected in any other mining lamp. The light makes little or no smoke, and requires no snuffing for 24 hours, and it can be raised up and down by an adjusting screw in a much simpler and more effective manner than in any other mining lamp now in use. The lamp is new, and up to this time has not been used in a mine. Its light was contrasted with a common Davy and the five lamps above slightly noticed, and it appeared superior to any of them. The inventor stated that it it only consumed 1½d. worth of oil in 15 hours.—A favourable opinion was expressed on the advantages of the new lamp, but it was suggested that it be tried in a mine, and Mr. Sherwood placed it in the hands of Mr. A. Howlett, of the Ince Hall Coal Company, to be tested in their mines.

MINERS' SAFETY LAMPS.

The many propositions which have been made by practical and scientific men for improving upon the system of safety lamps at present in use have not been without effect, although, perhaps, the desideratum is not yet attained. We have before alluded to the invention of Mr. Mozard, and expressed our opinion that his lamp could be used with great advantage in mines where fire-damp existed; but as Mr. Mozard's claims are for so arranging a miner's lamp that the gauze shade cannot be removed without extinguishing the flame, and the arrangement of the metal chimney, and the cylinder of wire gauze closed at the top and bottom, it must be admitted that similar claims had previously been made; and, therefore, the doubts which have been freely expressed as to the priority of Mr. Mozard's invention are not altogether without foundation. Mr. Mozard's patent is dated Sept. 3, 1856, and from the description and drawings filed, his lamp appears to be an ordinary Muesseler, with the all-important improvement which prevents the lamp being opened without extinguishing the flame. But in this part of the invention he was anticipated by upwards of a year, as Mr. André Dubrulle, of Lille, whose patent is dated Aug. 20, 1855, states that his improvements consist in the particular dispositions, whereby the lamps cannot be opened without being previously extinguished. Mr. Dubrulle describes several forms of lamps which would be applied in different cases; the two shown above being modifications of the Davy and Muesseler respectively, the others are intended for ships and domestic purposes. The letters represent the same parts in each,

Fig. 1.

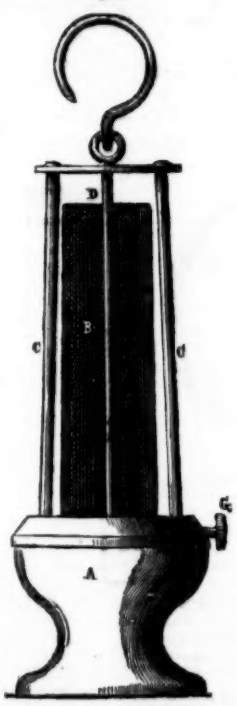
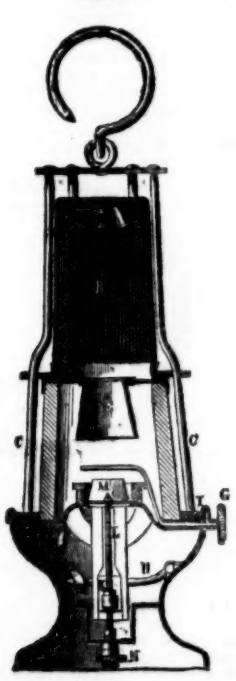


Fig. 2.



A being the body of the lamp, or reservoir for oil; C, thick iron-wire guards; B, gauze, as in the Davy lamp; E, chimney; D, corrugated iron cover to receive the action of the flame, and prevent the heating and rapid destruction of the gauze. The guard rods, C, support the diaphragm, which is placed upon the body of the lamp, and in the modification of the Davy the gauze is connected thereto. This diaphragm is fixed on the lamp with a bayonet joint, the stops, I, engaging in catches provided in the diaphragm. The lamp being lighted and closed, cannot beopened without first extinguishing the flame. This is done in the following manner:—The male vertical screw, L, is engaged in a nut with a female screw, K, forming part of the wick-holder, M, which moves up and down in a slide by turning the button, N. The wick-holder, when lowered, acts upon the forked extremity of a wire that releases the spiral spring, H, which, when the lamp was closed, forced its upper extremity into a hole in the diaphragm and prevented its turning; this wire once lowered, the top of the lamp can be taken off, but as the wick-holder has been previously lowered, the flame has been extinguished before it is possible to open the lamp. Instead of employing the screw, L, to raise and lower the wick-holder and compress the spring, H, the wick-holder can be furnished with a hook-shaped wire, which moves a pinion placed upon a horizontal arm extending beyond the reservoir, and carrying a similar button to N, and the oil reservoir can by this means be made shallower.

In the lamp represented by fig. 2, there is a second annular diaphragm soldered to the rods, C; the wick, when burnt, can be knocked of by means of the bent wire moved by the button, G. Mr. Dubrulle had his lamps at the Paris exhibition, and has obtained a silver medal from the Société d'Encouragement. As to weight, this lamp is somewhat lighter than the Davy, whilst its illuminating power is considerably greater; being equal to any which has yet been produced. The lamps have for sometime been undergoing a practical test in the mines d'Anzin, 3500 being in use, and it is stated that the cost of manufacture is but 3s. 6d., so that they could be very cheaply supplied in England. The testimonial from Mr. Lebret, the manager of the mines referred to, is of a flattering character, and there appears nothing to prevent the general adoption of the lamps.

LIFTING JACKS.—Mr. Michel has invented an improved lifting jack. The jack consists of an outer casing, which is made broader at bottom than at top, in order to afford an extended base. The side casing is screwed to a base plate, which at each of the four corners is armed with pointed blocks for fixing the jacks while at work, and keeping them steady. From the base plate, extending about two-thirds of the height of the jacks, are four uprights, which support a strong plate, hollow in the centre; this plate is also bolted to the outer casing, upon this plate rests a hollow nut, through which the main shaft of the jack passes. The shaft is screw threaded, and extends from the bottom plate through the top plate or cover of the casing. The hollow nut is threaded on the inside, and carries on the outside, and near the centre thereof, a worm wheel; a worm or endless screw, mounted in bearings on two sides of the casing, drives the worm and causes the nut to rotate; the axis of the endless screw is prolonged at one end to receive a ratchet-lever. This lever is formed with an arm; and through a joint in the lever (which can be fixed at pleasure), the lever may be used as a lever or crank handle. The top of the screwed shaft is thinned to receive a crab, while another crab, projecting horizontally from the lower part of one of the side casings, is connected to and raised by the lower end of the shaft. The jacks may be employed without a screw arrangement for shifting them along a bed, or a bed, with a screw gearing into a nut in or on the bottom plate of the jacks for moving them to and fro on the bed, may be used.

IRON AND STEEL MANUFACTURE.

[FROM S. D. ROGERS'S FORTHCOMING "TREATISE."]

There is one metalloid which I have never even seen conjectured as likely to be an alloy of steel, and yet nothing is more probable. All the steel iron on the Continent, including that of Danemora, or the best marks of Russia, are acknowledged to be smelted from mixtures in which the spathose ores constitute the principal parts. Now, all these ores, as well as the minerals used for fluxes, particularly at Danemora, contain comparatively large quantities of *magnesia*: and hence the pig or cast metal made from such mixtures will, beyond doubt, if properly smelted—that is, a fully carbureted pig obtained—be found to contain a notable portion of *magnesium* in combination with the iron and other metallic elements of the pig. Of this fact we have the sage authority of M. Berzelius, who states that, in the analysis of best Swedish pig-iron, he found it to contain—

Iron	90·6	
Silicium	0·5	
Magnesium	0·2	in 100 parts.
Manganese	4·57	
Carbon	3·63	

Now, it is a fact very well known among investigating chemists, that when any two or more metals are chemically combined—that is, alloyed together—it is an exceedingly difficult matter to cause a complete separation of them. Hence, we may rest perfectly satisfied that, whatever metal or metalloids may be combined in pig or cast-iron in the smelting process, there will always be a minimum of such alloy remain in the wrought-iron or steel made from such pig or cast-iron, be the processes of manufacture whatever they may. Here we have another reason or cause for the manifold shades of difference in the qualities of both steel and iron, for the same principles govern in both cases. My examinations on steel have been very circumscribed: my whole attention during a long life has been devoted to the investigation of the nature and properties, and to their actions and re-actions in the blast furnace, of iron-making materials, almost exclusively; but from even the very slight examinations I have made with respect to cast-steel, I have seen sufficient to be convinced that the samples I operated upon did contain, in the analytical result, *magnesia*, which, to me at least, was proof enough of the presence of *magnesium* in the steel in question—a metal of "silvery whiteness, comparatively soft, and exceedingly malleable." Now, may not a small alloy—even 1-500th part of this metalloid be the cause of the high estimation in which certain Swedish irons are held by steelmakers? This I consider to be a point entitled to the best consideration of cast-steel makers in particular; for if fully established, we should have the way opened to the production of iron in our own country equal for steel-making purposes to any foreign iron whatsoever.

PERMANENT WAY OF RAILWAYS.—The effective and advantageous substitution of cast-iron for wooden sleepers appears to have been at length accomplished by the Permanent Way Company, who have conducted a series of experiments with a view to ascertain the best form of sleeper for general use. The accounts of the several railways in the United Kingdom show that the average expense of renewing the permanent way, exclusive of the ordinary maintenance, is fully 100*l.* per mile per annum, or 50*l.* per mile single, being equal to 800,000*l.* for the gross mileage. Of this renewal charge rails absorb 37 per cent.; sleepers, 45 per cent.; chairs, 6 per cent.; fastenings, 7 per cent.; and labour, 5 per cent. Rails and sleepers, therefore, appear as the greatest items of cost, whence it is evident that these are the points which require the greatest amount of attention. It has been shown by the result of more than 200 miles of permanent way in this country, and a much greater length abroad, that cast-iron sleepers may be laid down with very little extra outlay, and none in the labour of maintenance. The breakage of sleepers is unimportant in practice, although this was one of the main objections urged against their use, and it only remains to be decided what form would give the greatest strength with a given quantity of material. In comparing the relative values of the two descriptions, it appears that in from twelve to fourteen years wooden sleepers decay and leave no value, whilst those of cast-iron, in addition to having double the duration, are capable of being re-cast into any form that experience may prove desirable, and that at an expense not exceeding one-fourth of their original cost; and the means of accomplishing this are so simple, that in lines of any considerable length the apparatus for this purpose might be erected, and the old sleepers converted, without the necessity of conveyance to a distance. But in the use of iron sleepers there is a rigidity to be provided against when certain descriptions of ballast cannot be obtained, and this it is proposed to remedy by using wood in certain parts of the construction. With regard to rails, the longer duration of the double-headed rail is generally admitted, and would be universally so were it not for the fact, that the under surface gets worn into indentations at the seat in the chairs, so that when turned it is full of notches, making the road not merely extremely uncomfortable and noisy to travel over, but the duration of the surface so deteriorated is barely one-half what it would be if the rail could be so held as to preserve the under surface whilst the upper sustains its wear. Another important point is, that the road be so constructed that the shape of the rail may be changed without disturbing the sleepers, for unless such be the system adopted the line is precisely the same as a newly-formed road for some time after the way has been renewed. All things considered, it appears that, when a flat-bottomed rail is used, Mr. De Bergue's sleeper is the best. By the pamphlet issued by the company, it is shown that the saving of the cast-iron road as compared with the ordinary timber road with a similar bearing surface, is 33*l.* 4*s.* per mile, single, per annum, being equal to 531,200*l.* upon the whole milage of the kingdom. In India and other tropical climates, this saving would, of course, be considerably greater.

SELF-ACTING BUFFER BREAK.—Mr. W. Lukyn, Parkside, Nottingham, has invented an improved description of buffer break, which obtains its self-acting power from the collision of the buffers, which striking each other, either on collision of the carriages or at the control of the breaksman, the breaks are brought upon every wheel throughout the line in quick succession, but not at one blow, which would render the invention useless, from the shock it would create. The breaks are connected with the buffer by levers and a regulating break screw, which prevents the wheels becoming locked. In shunting a train a lever is attached to the tender, which communicates with a rod and coupling links, and passing along the centre of each carriage relieves the buffer rod from the break. In starting a train, the whole operation consists in connecting the coupling links, and throwing the lever forward, so that in the event of collision by surprise, accident, neglect, or carelessness, by two trains coming into collision, or any obstruction on the line, the buffers would act upon each other, forcing the break upon the wheel of each opposing carriage throughout the line, thus greatly diminishing the effect of the fatal disasters which are almost daily reported.

CHEMICAL ANALYSIS.—An attempt has been made to supply a want which has long been felt by commercial and other persons in this country from the absence of a popular work upon chemical analysis, by the translation, or rather the adaptation of Dr. P. A. Bolley's treatise to the use of the English, the task having been undertaken by Dr. B. H. Paul, late principal assistant to Mr. Graham, at University College. The work forms a volume of "Bohn's Scientific Library," and its price, therefore, places it within the reach of all. Perhaps no manual of a more practical nature than Dr. Bolley's could have been chosen, its being expressly designed for those who did not require, or were disinclined to undergo, the labourious studies and strict scientific training which chemistry demands; in fact, for men of business, and it is, therefore, written in a business-like manner. The operations connected with chemical investigations, and the apparatus necessary for conducting analyses are fully described, and no better account for the reagents and their uses could be wished for; but we think that, considering the book as specially intended for Englishmen who do not possess so extended a knowledge as the members of the learned professions, a great mistake has been made in retaining foreign weights and measures, which, to say the least that could be argued against it, is calculated to confuse. This confusion is not diminished by English measures being frequently employed. Where it is simply a matter of proportion, of course, it matters little whether the parts be called grammes or ounces, but where measures of different denominations occur in the same sentence the case becomes widely different; thus, the words "the quantity for 4·36 grammes of substance would be 7·30 grammes for binoxide of manganese, and 6·00 grammes for the sesquioxide" taken alone would be equally intelligible whether the weights represented be grammes or otherwise—the proportions remaining the same; not so, however, with the sentence "100 cubic centimeters of this solution are equivalent to 10 grammes of ferrocyanide," where, from the measures being of different calculation, is necessary and sometimes tedious calculation too. In treating the analysis of soils, &c., the first six pages appear to contain French measures only, then a few pages with English measures only, and afterwards we find French again. Although we have pointed out these facts, it must not be supposed that the actual value of the work is diminished, nor that every reader would experience the difficulty we allude to, but we contend that in the compilation of a scientific work to be read by Englishmen, English and nothing but English should be used. The manual, taken as a whole, is well worthy of a place in every scientific library, and cannot fail to be of utility to all who may have occasion to conduct an analysis. Dr. Paul has certainly contributed a treatise which is in advance of any of the same class which has yet appeared in this country, and one which will, for some time at least, be employed as a general work of reference.

MANUFACTURE OF ORDNANCE.

We have frequently referred to the necessity for an improved description of ordnance, and as perfection cannot be arrived at at once, we may regard an advance in the manufacturing department as an event of some importance. Mr. Duncan Morrison, of Bordesley Works, Birmingham, has patented an invention, which consists, firstly, in inserting a metallic core in the axis of the mould in which the ordnance is cast, the melted metal being poured into the annular space between the mould and the core. By this method the bore will be both smooth and hard, and the ordinary process of boring rendered unnecessary. By making suitable helical projections upon the core, corresponding grooves will be formed in the casting, producing in the ordnance the effect called rifling. The core must not be made truly cylindrical, but must slightly taper, in order to permit of its withdrawal. The method of supporting the core in the axis of the mould may be effected by the means commonly practised in casting operations. A metallic tubular lining may be inserted in ordnance made by the method last described.

The second part of the invention consists in casting ordnance upon a tube of copper, brass, or other suitable metal or alloy, which said tube constitutes the bore of the ordnance, and forms with the casting one compact mass. The tube may be kept cool during the casting, by the introduction of a core of metal or fine loam, or sand, or by a water stream. A tube of wrought-iron or steel may be used in place of a copper or brass tube, for the casting to be formed upon. Touch-holes may either be formed in the casting, or tubes may be inserted for that purpose in the mould. When the tube is worn, it may be bored out, and replaced by another.

This process is sometimes thus modified:—Instead of casting metal upon the tube constituting the bore of the ordnance, the inventor supports and strengthens the said tube by applying bars of iron or steel to the exterior of the tube, and fixes them thereon by screwing or otherwise. He prefers to employ a series of bars having a wedge-shape in transverse section—that is to say, a series of bars of the form that would be produced by dividing a hollow cylinder into a series of planes, whose common intersection is in the axis of the cylinder. The sides of the said bars may be made to engage with one another by projections in one bar entering depressions in the next. Where steel bars of the kind last described are employed, the internal tube may be made very thin, or may be altogether omitted—the ordnance in the last case being made by the binding togethes of prismatic bars, so as to form a hollow cylinder, or a hollow cylinder closed at one end. He claims as his invention—Firstly, casting ordnance in moulds having a metal core, upon which the bore is cast, whether plain or furnished, with a curved projection to rifle the bore; also inserting tubular metallic linings in the said ordnance. Secondly, casting ordnance upon a metallic tube, which said tube remains in the casting, and constitutes the bore; also boring out the said tubes when worn, and replacing them by new ones. Thirdly, manufacturing ordnance by supporting a tube by means of prismatic bars, situate around, and fixed upon, the said tube. Fourthly, manufacturing ordnance by binding together a series of bars of steel, of such forms that when bound together they constitute a hollow cylinder, either open or closed at one end.

IMPROVEMENTS IN IRON AND WOODEN SHIPS.—Mr. Hyde, of Cumberland Iron-Works, Bristol, has just specified his patent (obtained per Mr. Campin, the patent agent), for improvements in iron and wooden ships, which he thus describes:—"I construct the after part of iron, or of wooden ships, in a somewhat similar manner to that adopted in my invention patented Nov. 29, 1854, but in this case I adapt the ship for the reception of a propeller with two blades, the great difference between the present and my former invention being that I increase the width of that part of the ship adjacent to the "screw post" throughout its entire length, so as to admit of the propeller being enclosed (when needful) by suitable shutters, or sliding plates, within the lines of the ship, and for a distance of, say, 2 or 3 ft. immediately forward of the screw post the said lines will be more curved or sudden than the afterbody otherwise would be. Also, that I can adapt this arrangement to wooden ships, so as not to materially weaken the structure of the same, which I purpose to effect by cutting away the deadwood, and then framing the said arrangement, with the shutters, &c., into the deadwood; or, by adding to the after end of the ordinary "stern post" and keel of wooden ships a frame of iron, containing the said arrangement, with sliding shutters, propeller, rudder post, and screw post, in one wrought-iron frame, adapted to be bolted on to the keel, the stern post and the deadwood thus forming an external frame to the present frame of wooden ships, rendering it unnecessary to cut out the deadwood. Also, I adapt the run, or narrow part of the after end of an iron ship in such manner as to use the same for a condenser; this I effect by partitioning off in the interior of the said part a portion of the run of the ship, sufficiently large for the purpose of condensing, which partitioning strengthens the said ship where it is most required, and at the same time admits of the condensing chamber thus formed being provided with a man-hole, to allow of its being entered for the purposes of cleaning and repairs. The efficiency of which condensing chamber may be increased by the introduction of pipes, to allow the cold water outside the vessel to pass through the chamber; the said pipes may be constructed of any convenient form to serve the purpose of stays to strengthen the chamber, as well as to form additional surfaces to the condenser, the condensed water from the steam being pumped back into the boiler in the usual way." The inventor claims—"The constructing the after part of a ship or vessel as stated, so as to enable me to use a propeller of more than one blade, and enclose the same (when needful) by means of shutters, or sliding plates, as before explained; also, the adaptation of this system of enclosed shutters, or sliding plates, to wooden ships, either let into the deadwood of the said ships, or attached externally, in a wrought-iron frame, abaft the present stern post. And, also, adapting the run, or after part of iron ships for the purpose of condensing, by partitioning off a portion of the said run, hereinbefore set forth."

ELECTRO-TELEGRAPHIC CABLES—(*From our Paris correspondent.*)—A new system of constructing and laying down submarine electro-telegraphic cables has been submitted to the notice of the Academie des Sciences by M. A. Balestrini. The conditions which a cable should fulfil are—complete security to the conducting wire, which should be thoroughly and durably insulated; the maximum of lightness and flexibility consistent with strength and solidity; and lastly, a total absence of any inclination or liability to twist and form knots, or, in other words, to break. It is also desirable that some means should be devised to sectionise submarine cables, to permit of the solid, prompt, and sure union of different sections; of the establishment of branch lines—in fine, to simplify the establishment of complicated lines of submarine electro-telegraphic communication, and to permit of the facile repairing of the cable in cases of accident or deterioration. The following is the mode by which M. Balestrini proposes to achieve these desirable results. Around a central cord, as a core, is wound an uninsulated copper wire, in a spiral direction, for the purpose of allowing the currents of induction to pass. Over this wire, but in a reverse direction, are spirally wound copper wires, insulated by gutta percha, and varying in number from two to six, according to the importance of the line. Over the telegraphic wires, but in a reverse direction, are wound light hempen cords, saturated with an elastic fatty and insulating composition, partially composed of caoutchouc. Lastly, a common cord is spun round the cable, and then the whole enveloped in an impermeable fabric. Such is the proposed mode of constructing the cable for great depths. The portions laid in shallows, or near the coast, should be protected by the ordinary envelope of wire rope. The wires are from four to eight in number, from 3 to 2½ millimeters in thickness, and are wound spirally, in a reverse direction to the cord. A galvanised iron wire, of from 1 to 2 millemeters in thickness, is wound over this again, so as to form a galvanic element, which induces the conglomeration of calcareous and saline matters round the cable, so as to form a mineral envelope for it. In rocky bottoms, the galvanised iron wire is replaced by a steel wire, between which and the common iron wires are sheets of zinc to pass the galvanic element. The first advantage which M. Balestrini states a cable of this kind to possess is the preventing of retardation. When communication is made through a long length of line, the electric current, in its passage, gives rise to an electric current in the gutta percha envelope, in the opposite direction. This second current is called the current of induction. It intercepts and retards the progress of the communicating current, and so diminishes the number of despatches that may be sent. Secondly, the spiral arrangement of the wires allows the cord to assume any curve, and to be elongated, without the wires themselves being at all stretched. Thirdly, the wires being wound spirally, in opposite directions, will effectually prevent the cable twisting and forming knots. Fourthly, the flexibility of the cable allows of its being wound on drums of smaller diameter than are at present used; and this quality, together with its lightness, will allow of the laying down of the cable in the greatest depths being regulated with the greatest facility. The last, and by no means least, advantage, is the comparative cheapness of M. Balestini's cable; although, most assuredly, the spiral direction given to the wires would cause a much larger quantity of copper to be used than in Newall's cables, and which may make M. Balestini's much dearer than he anticipates. The same observation, I believe, will be found to apply with equal force to the extra quantity of gutta percha and labour that his system will require. To prevent the cable breaking by its weight when heavily protected, and in great depths, it is suggested to sustain it by means of parachutes, or floats, placed at distance on distance, which would ease the descent. Without particularly describing their construction or mode of using, the author proposes cast-iron junction cases, which he terms submarine stations, by means of which branch lines may be established. These cases are to be so constructed as to admit of their being easily brought to the surface, in case of repairs being necessary to the cable. As M. Balestini's memoire was, as he acknowledged, merely preliminary, it is to be hoped that he will favour the public with more details, and, if possible, with the results of some practical trials. Mention was also made of an electrical sounding apparatus, which sounds a warning, and marks the depth, and which any of your readers can easily understand.

RAILWAY BREAKS.—Mr. L. D. Jackson, Underwood, has invented a pneumatic break, which is intended to be attached to each carriage, by means of a connexion from one end of the train to the other, by a simple contrivance (a square linked chain between the carriages), to be attached and detached. A traversing plummer block is fixed at each end of carriage or truck to allow for oscillation; the links are to be made sufficiently long to allow for elongation between the carriages. A small plummer block is attached, as near to the centre of the carriage or truck and underneath the same, to form a bearing, and near to this bearing to have on the shaft either a screw, eccentric cam, or other appliance necessary for putting the break in or out of gear, so as to place the same under the control of either the engine-driver, stoker, or guard, thus enabling either of them to apply the breaks direct throughout the train. For instance, if the engine-man should see a train in front of him, or danger on the line, he may at once put the whole of the breaks throughout the train into action, and also by means of the connection communicate with the guard or guards by ringing a bell attached to their carriage. The breaks are worked by a cam or eccentric fixed on the axle of the carriage, which, when put in gear, and so long as the axle turns, works the pump, which forces the breaks powerfully against the wheels on the carriages or trucks until they are stopped. To effect this, an arrangement of machinery is placed on the block bar, or under the bottom of the carriage, consisting of a cylinder, piston, and rod, connected by means of a lever and links. To the present way-shaft a pump or air-pump is connected to cylinder, to condence or compress air into the cylinder to force the piston attached to the lever on the way shaft. The pump or air-pump is worked by a link, chuck, or other means attached to a lever from a cam or eccentric, which, when put in gear, is worked by the rotative action of the axletree.

REPORT ON PATENTS.—The applications for provisional protection in 1856 were 3106; the number of patents passed, 2094; the specifications filed in pursuance thereof, 2048; and the applications lapsed or forfeited, 1012. The applications recorded within the first six months of the year are 1830, so that an increase of 600 on the whole year may be expected. The expenses of the office of the Commissioners for 1856 amounted to 5850*l.*, and the amount of stamp duties paid on passing patents was 91,115*l.*

THE MILL DAM MINING COMPANY,

GREAT HUCKLOW, NEAR BYAM, DERBYSHIRE.

Capital, £3000, in 1000 shares of £2 each.

Deposit, 3s. 6d. per share, must accompany each application.

To be registered under the Limited Liability Act.

This company is formed for the purpose of extending the mining operations at the above mine by the erection of a steam-engine, and the providing of pumps and other materials for working the same.

This mine is leased to the present holders for a term of 20 years, 17 of which are unexpired, on the terms of 2s. per load of nine dishes, which is the only tax upon the mine. It has been worked by a few private individuals since 1850 by means of a gin, and during wet seasons it has been suspended in consequence of there being no machinery at the mine to pump out the water, which has subsided on the recurrence of fine weather. The mine, in consequence, has not been worked on an average more than six months in the year. Had the mine been worked the whole of the year, the dues paid by the lessees, according to the average payment of the last seven years, would have been £333 7s. 1d. The average profits of the last two years' working of six men and three boys have been £174, and the profits of the last measure of six weeks' workings of the same complement of hands are £33 14s.; and the ore ready got and to be measured during the present month is fully anticipated to yield £60 profit, after paying the dues and all expenses of getting. These results have been obtained under all the disadvantages of the present machinery.

There is no doubt that an engine of moderate power would be amply sufficient during all seasons to keep the mine clear of water; and with the advantages of steam power and improved machinery, a very large profit will in all probability be realised.

The mineral sett leased to the present holders is 4 acres, and twice as much additional ground can be obtained, if desired.

The present holders of the mine and their friends have already taken a considerable number of shares.

The capital to be raised by calls at intervals of two or three months.

The minerals and plant, for the unexpired term of the lease (17 years) to be taken at a valuation, by valuers to be appointed on behalf of the lessees and the company.

The mine is now being worked, and the erection of a steam-engine will not interfere with the present workings.

Application for shares to be addressed to EDWARD B. PALMER, Chesterfield, secretary *pro tem.*, of whom prospectuses and all further information may be obtained.

August 6, 1857. 150

SLATE SLABS AND ROOFING SLATES.—

The PROPRIETORS of the NEW MACHNO SLATE and SLAB COMPANY (LIMITED) have, at great cost, made arrangements to convey their produce from their quarries near Ffestiniog to Conway, to obtain the great advantage of access to the railway, giving them the facility of executing orders without the slightest delay. They trust that making Conway their shipping port will not cause them to be confounded with those hitherto known as the CONWAY SLATES, as the MACHNO SLATES are ENTIRELY FREE from PYRITES, or any metallic substance liable to OXIDATION; and, from having been tested in Wales for at least half-a-century, are found to attain a degree of hardness, by exposure to the atmosphere, unknown in any other vein. The MACHNO SLABS are too well known to need comment, but the annexed valuable testimonial from Mr. Magnus, and also a strong chemical test to which they have been subjected, will better explain their quality:—

Pimlico Slate Works, Upper Belgrave-place, London, April 7, 1855.—GENTLEMEN: I very readily offer my testimony to the excellence of your slabs raised at the Machno Quarries. I prefer them to all others obtained in North Wales, with one exception, and that is much of the same quality as the Machno. The slabs can be obtained of large sizes, and of every requisite thickness. They are homogeneous in texture, strong, of good colour, free from spots and other impurities, pleasant to the tool of the mason, easily planed and moulded, and will bear exposure to a much higher degree of heat than slabs from any of the Carnarvonshire quarries.

Signed, G. E. MAGNUS.

To the Proprietors of the Machno Slate and Slab Quarries.

Liverpool, Oct. 18, 1855.—DEAR SIR: The experiments which I have tried on the specimen of slate, in reference to its capability of resistance to acids, enable me to pronounce it in every way capable of retaining boiling vinegar, without injury either to its own substance, or to the contained vinegar. A piece of the slate, weighing 95 grs., was exposed for 26 hours to the action of cold strong nitric acid; it was then boiled in the same acid for 20 minutes, and when washed, dried, and weighed, was found not to have lost perceptibly in weight. This I consider the most conclusive experiment.

Signed, GEO. C. HUSON.

Wm. Orme Carter, Esq., Machno Slate and Slab Company.

All communications must be addressed to the resident director, Mr. T. H. WHEELER, Conway, North Wales. 152

PUMP BUCKETS.—IMPORTANT TO COLLIERY AND MINING PROPRIETORS, SHIP OWNERS, ENGINEERS, &c.

KENNEDY AND EASTWOOD'S PATENT EXPANDING RING CLACK BUCKETS.—These buckets are APPLICABLE to every description of AIR and LIFT PUMPS, and are being generally adopted, on account of their great durability, entirely dispensing with the use of leather or gutta percha. Being made of metal, the friction is greatly reduced, and have been proved to require at least one-third less power to work them than buckets made of either leather or gutta percha, and doing their work more efficiently.

TESTIMONIAL.

Whitehaven, March 26, 1857.—GENTLEMEN: We have much pleasure in informing you that your Patent Pump Bucket is giving us the greatest satisfaction, and we shall certainly use no other kind in future. We shall be glad if you will send us a few of your prospectuses, we wish to send one to a friend in Staffordshire. Please to take care of the gauges, that you may at any time make new rings for us by them, the one you now have is for our bottom lift.

Your's, truly, (Pro S. W. SMITH AND CO.), A. HODGETTS.

Messrs. Kennedy and Eastwood.

KENNEDY and EASTWOOD have also a NEW PATENT METAL BOTTOM CLACK (to work with their Patent Buckets), which entirely dispenses with the use of leather or gutta percha, and is highly recommended for the efficiency of its working and great durability. A wire gauge, the exact size of the working-barrel, should accompany each order.

Terms, drawings, testimonials, and other information, will be supplied (gratis) on application to Messrs. KENNEDY and EASTWOOD, patentees, Ulverstone, Lancashire; Messrs. HEWITT and ALLOTT, accountants, Central Chambers, Sheffield; and Messrs. H. J. MORTON and Co., 2, Basinghall-buildings, Leeds. 153

NEW PATENT ACT, 1852.—Mr. CAMPIN,

having advocated Patent Law Reform before the Government and Legislature, and in the pages of the *Mining Journal*, &c., is now READY to ADVISE and ASSIST INVENTORS in OBTAINING PATENTS, &c., under the NEW ACT.

The Circular of Information, gratis, on application to the Patent Office and Designs' Registry, 166, Strand. 154

THE PRACTICAL MECHANICS' JOURNAL (August, 1857, 1s.)

contains a large sized Copper-plate Engraving of Mr. Condie's Patent Moving Cylinder 6¼ tons Steam Hammer, as erected at the Glasgow Forge of Alex. Fulton, Esq., 50 Wood Engravings, and 28 quarto pages of letter-press, with Original Articles on the Steam Hammer, Art Treasures Exhibition at Manchester, Telescopic Cradle for Heaving-up Vessels, Royal Institution, Mechanical Notes from America, Clunes and Macintosh's Bottling Apparatus, Rennie's Self-acting Trap-doors for Mines, Surveying Instrument for Mines, Dryden's Power Looms, Howard's Moulding, Hill's Brakes, Tucker's Drying Glue, Haythorn's Flower and Fruit Gatherer, Capt. Norton's Elongated Rifle Shot, Mountain-top Railway, Dunbar's Boat Gear, Bertram's Steam-Engines, Coal-burning Locomotives, Sulphur from Pyrites, American Hydrant, Law Reports of Patents.

London: Longman and Co., Paternoster-row; Editor's Offices (Offices for Patents), 47, Lincoln's Inn-fields. 155

INVESTMENTS IN BRITISH MINES.

Full particulars of the most important Dividend and Progressive Mines will be found in the Fourth Edition of

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Recently published, by J. H. MURCHISON, Esq., F.G.S., F.S.S.

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Mr. MURCHISON also publishes a QUARTERLY REVIEW OF BRITISH MINING, giving, at the same time, the Position and Prospects of the Mines at the end of each Quarter, the Dividends Paid, &c. The REVIEW for the Quarter ending the 30th of June, contains a Map of the Great Wheal Vor and Lelant Mining Districts, price 1s. Reliable information and advice will at any time be given by Mr. MURCHISON, either personally or by letter, at his offices, 117, Bishopsgate-street Within, London, where copies of the above publications can be obtained.

OPINIONS OF THE PRESS.

Mr. Murchison's new work on British Mines is attracting a great deal of attention, and is considered a very useful publication, and calculated to considerably improve the position of home mine investments.—Mining Journal.

The book will be found extremely valuable.—Observer.

A valuable little book.—Globe.

A valuable guide to investors.—Herapath

Mr. Murchison takes sound views upon the important subject of his book, and has placed, for a small sum, within the reach of all persons contemplating making investments in mining shares that information which should prevent rash speculation and unproductive outlay of capital in mines.—Morning Herald.

Of special interest to persons having capital employed, or who may be desirous of investing in mines.—Morning Chronicle.

Of great value to capitalists.—Sunderland Times.

Parties requiring information on mining investments will find no better and safer instructor than Mr. Murchison.—Leeds Times.

As a guide for the investment of capital in mining operations is inestimable. One of the most valuable mining publications which has come under our notice, and contains more information than any other on the subject of which it treats.—Derby Telegraph.

To those who wish to invest capital in British mines, this work is of the first importance.—Welshman.

This work enables the capitalist to invest on sound principles; it is, in truth, an excellent guide.—Plymouth Journal.

All who have invested, or intend to invest, in mines, will do well to consult this very useful work.—Ipswich Express.

This is really a practical work for the capitalist.—Stockport Advertiser.

Persons desirous to invest their capital in mining speculations, will find this work a very useful guide.—Warwick Advertiser.

It is full of carefully compiled and reliable information relative to all the known mines in the United Kingdom.—Sheffield Free Press.

Those interested in mining affairs, or who are desirous of becoming speculators, should obtain and carefully peruse the work.—Monmouth Beacon.

Every person connected, or who thinks of connecting himself with mining speculations, should possess himself of this book.—North Wales Chronicle.

A very valuable book.—Cornwall Gazette. [Glasgow Examiner.

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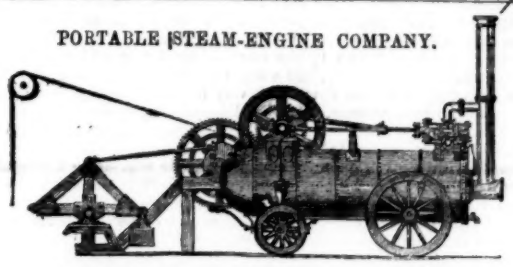

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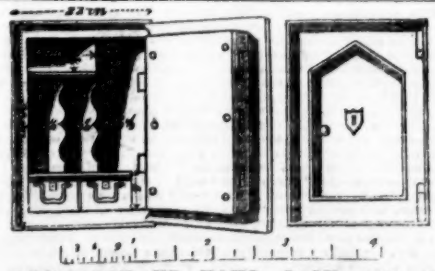

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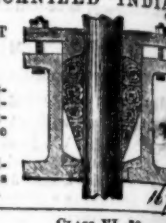

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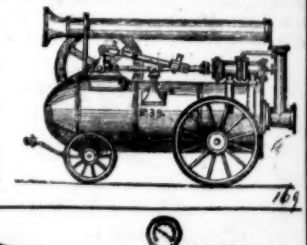

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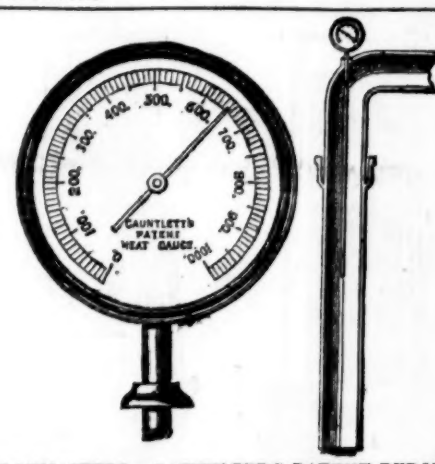

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